Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method of performing two-dimensional Nuclear Magnetic Resonance (NMR) spectroscopy on a hyperpolarized sample, which method comprises the steps of:

   - hyperpolarizing a sample which comprises a first nuclear species (I) and a second nuclear species (S), with the Hamiltonian $H = H_S + H_{IS} + H_I$ using DNP, wherein the NMR active nuclei receive hyperpolarization and transformation of the sample to a liquid state;

   - performing two-dimensional NMR spectroscopy on the sample and thereby producing at least two NMR spectra with the use of a sequence of rf-pulses, wherein ~~the pulse~~ pulse sequence comprises at least two rf-pulses ~~, either~~ on the same ~~nuclei or on different nuclei~~, and wherein the ~~pulse~~ pulse sequence is adapted for a hyperpolarized sample in such a way that it uses a single scan, an efficient trajectory in a t_S-t_{IS} plane and produces a square array of observed points in a square portion of a two time space~~, thereby producing at least two NMR spectra~~;

   - analysing the at least two ~~of the~~ NMR spectra in order to obtain a characterization of the sample. ~~, or to obtain an interim result to be used in the NMR spectroscopy step~~

2. (Cancelled)

3. (Cancelled)

4. (Cancelled))

5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

10. (Cancelled)

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Currently amended) The NMR spectroscopy method according to claim 1~~8~~, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said ~~in performed on a hyperpolarized sample which comprises a first nuclear spin species (I) and a second nuclear spin species (S), the~~ pulse sequence comprises the step of:
- (300) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);
- (305) performing a ~~pulse I (i.e.~~ 180° pulse on I~~)~~, which leads to (N,-N);
- (310) waiting one time unit, leading to (N+1,-N+1);
- (315) performing ~~pulse IS (~~a 180° pulse on both I and S~~)~~, leading to (-N-1,-N+1);
- (320) observing points up to (N-2,N);
- (325) performing a 180° pulse on I, leading to (N-2,-N);
- (330) observing points up to (N+1,-N+3).

15. (Currently amended) The NMR spectroscopy method according to claim 1, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said ~~in performed on a hyperpolarized sample which comprises a first nuclear spin species (I) and a second nuclear spin species (S), the~~ pulse sequence comprises the step of::
- (300b) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);
- (305b) performing a ~~pulse I (i.e.~~180° pulse on I~~)~~, which leads to (N,-N);
- (310b) waiting one time unit, leading to (N+1,-N+1);

- (315b) performing a ~~pulse IS (a~~ 180° pulse on both I and S~~)~~, leading to (-N-1,-N+1);
- (320b) observing points up to (N-2,N);
- (340b) performing a 180° pulse on S, which reverses both time signs and leads to (-N+2,-N);
- (345b) observing points up to (N,N-2);
- (350b) performing a 180° pulse on I leading to (N,-N+2);
- (355b) observing points up to (N+1,-N+3).

16. (New) A method of performing two-dimensional Nuclear Magnetic Resonance (NMR) spectroscopy on a hyperpolarized sample, which method comprises the steps of:
- hyperpolarizing a sample which comprises a first nuclear species (I) and a second nuclear species (S), with the Hamiltonian $H = H_S + H_{IS} + H_I$ using DNP, wherein the NMR active nuclei receive hyperpolarization and transformation of the sample to a liquid state;
- performing two-dimensional NMR spectroscopy on the sample and thereby producing at least two NMR spectra with the use of a sequence of rf-pulses, wherein pulse sequence comprises at least two rf-pulses on different nuclei, and wherein pulse sequence is adapted for a hyperpolarized sample in such a way that it uses a single scan, an efficient trajectory in a t_S-t_{IS} plane and produces a square array of observed points in a square portion of a two time space,;
- analyzing the at least two NMR spectra in order to obtain a characterization of the sample.

17. (New) The NMR spectroscopy method according to claim 16, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said pulse sequence comprises the step of:
- (300) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);
- (305) performing a 180° pulse on I, which leads to (N,-N);
- (310) waiting one time unit, leading to (N+1,-N+1);
- (315) performing a 180° pulse on both I and S, leading to (-N-1,-N+1);

- (320) observing points up to (N-2,N);
- (325) performing a 180° pulse on I, leading to (N-2,-N);
- (330) observing points up to (N+1,-N+3).

18. (New) The NMR spectroscopy method according to claim 16, wherein the pulse sequence spans a trajectory in a two-dimensional evolution time space (t_S, t_{IS}), said pulse sequence comprises the step of::

- (300b) starting from the point (0,0), with an 90° pulse on S, observing N+1 points (i,i) up to point (N,N);
- (305b) performing a 180° pulse on I, which leads to (N,-N);
- (310b) waiting one time unit, leading to (N+1,-N+1);
- (315b) performing a 180° pulse on both I and S, leading to (-N-1,-N+1);
- (320b) observing points up to (N-2,N);
- (340b) performing a 180° pulse on S, which reverses both time signs and leads to (-N+2,-N);
- (345b) observing points up to (N,N-2);
- (350b) performing a 180° pulse on I leading to (N,-N+2);
- (355b) observing points up to (N+1,-N+3).